

## **Simulation of Thermal Behavior of Ground Concrete Slab Exposed to Solar Radiation**

Karunarathne A.M.A.N., .Mampearachchi W.K., Nanayakkara S.M.A.

Rate of heat flux from solar radiation, thermal properties of concrete and heat loss from concrete due to convection parameters of surrounding influence the temperature variation of an exposed concrete slab. Literature review has shown that a wide range of views on heat generation in concrete during the setting time and early age. This paper describes a method to incorporate the temperature variation of a concrete slab due to solar radiation to estimate the relevant deformation of concrete using finite element model (FEM) approach.

Variation of the temperature profile across a slab is well known fact and it cause differential thermal stresses and differential deformation of concrete structures. These stresses are very savior in rigid pavements in tropical countries. Deformation of slabs and pavements can lead to structural failures, efficiency drop downs, etc. Pre determination of ultimate deformation is important to taking relevant precautions.

ANSYS version 12 used to develop the FEM which was verified by a laboratory scale slab. It is one of the best non-linear analysis software to illustrate the thermal behavior of concrete. FEM gives temperature values at each location and hence the deformation also can be obtained. Prototype model constructed and measured the daily temperature variation at various points. Temperature profile at the centre was measured by thermocouples set across the thickness. Temperature variations were compared in the same points in FEM and the prototype for the verification.

The research provides a verified method to obtain temperature values at any location in a concrete slab which exposed to solar radiation. The deformation values at the particular locations can be obtained from FEM for varies thicknesses. Outcome is important in designing of expansion joints and load transfer non-dowelled joints in rigid pavements. Amount of curling and warping of pavements can be obtained using the FEM for varies lengths. The FEM approach is very helpful for proper designing of rigid pavements with less faulting, cracking and other distresses.

**Key words:** Radiation, temperature, deformation, FEM, verification